REMARKS

Claim Status

Claims 1-16 are now pending, with claims 1, 2, 9 and 10 being in independent form. Claims 1-11 have been amended. Dependent claims 12-16 have been added. The amendments to claims 1-8, 10 and 11 are merely cosmetic or clarifying in nature. No new matter has been added. Reconsideration of the application, as herein amended, is respectfully requested.

Overview of the Office Action

Claim 9 has been objected to because of a minor informality. Withdrawal of this objection is in order, as explained below.

Claims 1, 4, 5, 8 and 9 stand rejected under 35 U.S.C. §103(a) as unpatentable over U.S. Publication No. 2002/0126346 ("*Suzuki*") in view of "Demonstration of All-Optical Demultiplexing of a Multilevel Soliton Signal Employing Soliton Decomposition and Self-Frequency Shift", IEEE Photonics Technology Letter, Vol. 9, No. 6, June 1997 ("*Hatami-Hanza*") and U.S. Publication No. 2003/0058500 ("*Sugawara*"). Claim 7 stands rejected under 35 U.S.C. §103(a) as unpatentable over *Suzuki*, *Hatami-Hanza* and *Sugawara*, and further in view of U.S. Patent No. 5,726,789 ("*Horiuchi*"). Claims 2-5, 7, 10 and 11 stand rejected under 35 U.S.C. §103(a) as unpatentable over *Suzuki* in view of *Hatami-Hanza* and *Horiuchi*. Claim 8 stands rejected under 35 U.S.C. §103(a) as unpatentable over *Suzuki* and *Hatami-Hanza*, and further in view of *Sugawara*. Lastly, claim 6 stands rejected under 35 U.S.C. §103(a) as unpatentable over *Suzuki*, *Hatami-Hanza*, *Sugawara* and *Horiuchi*, and further in view of "Soliton Trapping in Birefringent Optical Fibers", Optic Letters, September 15, 1989 ("*Islam*").

Applicants have carefully considered the Examiner's rejections and the comments provided in support thereof. For the following reasons, applicants assert that all claims now pending in the present application are patentable over the cited art.

Amendments Addressing Formalities

The Examiner has objected to the language "according to claim 1 or 2" in line 4 of claim 9. In response to this objection, claim 9 has been amended in a self-explanatory manner. Withdrawal of this objection is therefore deemed to be in order.

Descriptive Summary of the Prior Art

Suzuki discloses an optical TDM multiplexing apparatus for time domain multiplexing of a plurality of input signals in an optical stage (see Abstract).

Hatami-Hanza discloses an apparatus for transforming a stream of a multilevel ASK TDM soliton signal into a WDM soliton-like signal which can be demultiplexed by an optical filter bank without the need to use an optical or electronic control signal (see pg. 835, discussion and conclusion).

Sugawara discloses an optical signal processing system that is configured to provide high-speed responses during long-distance, large-traffic, optical communication (see paragraph [0025]).

Horiuchi discloses a modulator and method for modulating short optical pulses such that the pulses retain their transmission characteristics even in the presence of temperature variations (see col. 4, lines 57-60).

Islam discloses high speed "trapping of orthogonally polarized solitons in bifringent optical fibers".

Summary of the Subject Matter Disclosed in the Specification

The following descriptive details are based on the specification. They are provided only for the convenience of the Examiner as part of the discussion presented herein, and are not intended to argue limitations which are unclaimed.

The specification discloses devices and methods for shifting WDM signals having pulses which are simultaneous and carried at different wavelengths into an OTDM signal having components which are time shifted and carried at the same wavelength to enable operation at very high bit rates, such that communications in long-haul optical transmission networks operating at very high bit rates of typically 40 Gbit/s and above can be achieved (see pg. 3, lines 16-25 of the specification as originally filed).

Patentability of the Independent Claims Under 35 U.S.C. §103(a)

The Examiner (at pg. 3 of the Office Action) acknowledges that *Suzuki* fails to teach or suggest, *inter alia*, "a birefringent propagation medium into which the WDM signals are injected in such a manner as to achieve a soliton trapping phenomenon", as recited in independent claims 1 and 9, and cites *Hatami-Hanza* for this feature. The Examiner (at pg. 7 of the Office Action) also acknowledges that *Suzuki* fails to teach or suggest, *inter alia*, "a birefringent propagation medium into which the OTDM signal is injected in such a manner as to achieve a soliton trapping phenomenon". The proffered combination of *Suzuki* and *Hatami-Hanza* fails, however, to achieve applicants' claimed devices and methods; there is in fact nothing in *Hatami-Hanza* to cure the above-noted deficiencies in *Suzuki*.

The Examiner (at pgs. 4 and 7 of the Office Action) asserts that:

> Hatami-Hanza et al teaches modulation means (the attenuators Att.1 to Att.4 in Figure 1) adapted to modify the optical power of the OTDM signals, (B) a birefringent propogation medium (the Fiber Spans in Figure 1) into which the OTDM signals are injected

> in such a manner as to achieve a soliton trapping phenomenon (page 834, Figure 2).
>
> ...
>
> Hatami-Hanza et al discloses a system and method to convert the OTDM signal into a WDM signal (Figure 1). Hatami-Hanza et al teaches absorption means (the attenuators Att.1 to Att.4 in Figure 1) adapted to introduce optical loses into the components of the OTDM signal, and a birefringent propagation medium (the Fiber Spans in Figure 1) into which the OTDM signal is injected in such a manner as to achieve a soliton trapping phenomenon (page 834, Figure 2).

Applicants respectfully disagree that the combination of *Suzuki* and *Hatami-Hanza* either teaches or suggests applicants' claimed device and method as now recited in independent claims 1, 2, 9 and 10.

Hatami-Hanza discloses a communication system comprising a laser source (i.e., a soliton F-8 fiber laser) for transmitting a pulse centered on a wavelength λ_0. *Hatami-Hanza* (pg. 833, section II) explains that "[a] figure-8 laser is used to produce the pulse which is initially divided into four branches or channels of solitons". *Hatami-Hanza* further describes that these solitons are attenuated and temporally shifted, i.e., at each branch an attenuator and a time delay is provided to control the power level and timing position of the pulse at each branch or in each channel. Consequently, *Hatami-Hanza* teaches a system in which each soliton has a different intensity value and a different temporal location. However, each soliton has the <u>same</u> wavelength as all of the other solitons. Figure 1 of *Hatami-Hanza* shows that these pulses having the <u>same</u> wavelength are then multiplexed into a TDM signal which is amplified in a doped Erbium fiber amplifier (EDFA).

As described at pg. 834, 1st paragraph of *Hatami-Hanza*, the output signal of the EDFA is transmitted over standard fibers having various lengths, e.g., 11.5 km and 34.5 km. *Hatami-Hanza* (pg. 834, 2nd col., 1st paragraph) explains that "pulses ... experience a wavelength shift ... due to the silica fiber Ramen process, which is known as soliton self-frequency shift". *Hatami-*

Hanza thus teaches that during the propagation of the pulse, a frequency shift phenomenon occurs for each elementary soliton which leads to a conversion of the signal into a WDM signal due to the Raman effect.

The *Hatami-Hanza* system, however, uses a simple, standard fiber. *Hatami-Hanza* fails to teach a birefringent propagating medium in which WDM signals (or OTDM) are injected to obtain a soliton trapping effect. Firstly, the pulses that are provided to the standard fiber of the *Hatami-Hanza* system to derive the WDM signal have the same wavelength. Independent claims 1 and 9, in contrast, recite that the wavelength division multiplex (WDM) signals have pulses which are simultaneous and carried at different wavelengths. It is these multiple wavelength pulses that are injected into applicants' claimed birefringent propagating medium. *Hatami-Hanza*, on the other hand, expressly explains that "[t]he multiplexed signal had a single peak in the spectrum indicating that all the pulses have the same wavelength and come from a single source" (see pg. 834, 1st paragraph, lines 6-9). *Hatami-Hanza* thus fails to teach the claimed birefringent propagating medium into which WDM signals having pulses which are simultaneous and carried at different wavelengths are injected, as recited in amended independent claims 1 and 9.

Applicants' independent claim 2, in contrast, recites "a birefringent propagation medium into which the OTDM signal is injected to achieve soliton trapping" to recover a WMD signal having pulses which are simultaneous and carried at different wavelengths. Independent claim 10 is the associated method. That is, independent claims 2 and 10 are directed to a demultiplexing device and method, respectively, for retrieving WDM signals having pulses which are simultaneous and carried at different wavelengths. With no teaching or suggestion of the claimed birefringent propagating medium for multiplexing the claimed WDM signals, it is

beyond dispute that *Hatami-Hanza* also fails to teach or suggest the demultiplexing device and method of respective independent claims 2 and 10.,

Moreover, the *Hatami-Hanza* system is limited to bitrates of 40 Gbit/s. As described at pg. 3, lines 16-25 of applicants' originally-filed specification, shifting a WDM signal having pulses which are simultaneous and carried at different wavelengths into an OTDM signal having components which are time shifted and carried at the same wavelength enables operation at very high bit rates and, thus, enables implementation of communications in long-haul optical transmission networks which operate at very high bit rates of typically 40 Gbit/s and above. *Hatami-Hanza* (pg. 833, section I) on the other hand expressly cautions that "the problem of pulse processing at the transmitter and the receiver ends, especially for all-optical demultiplexing of TDM signals with rates higher than 40 Gb/s, still remains a complex issue". *Hatami-Hanza* (pg. page 1, 1st col.) explains that it is very difficult to use the system at bitrates of greater than 40 Gbit/s and, thus teaches away from the claimed invention by expressly noting that its system only processes signals at 40 Gbit/s and below. There is accordingly no teaching or suggestion in the *Hatami-Hanza* document of any solution to this problem.

The Examiner (at pg. 4 of the Office Action) has cited *Sugarawa* based on the acknowledged failure of the *Suzuki* and *Hatami-Hanza* documents to teach or suggest an "absorption means adapted to equalize the powers of the optical pulses". According to the Examiner, such a feature "is well known and widely used in the art". Applicants, however, contend that no combination of *Suzuki*, *Hatami-Hanza* and/or *Sugarawa* achieves the subject matter of independent claims 1, 2, 9 and 10. There is simply nothing in *Sugarawa* to cure the above-discussed deficiencies in *Suzuki* and *Hatami-Hanza* relating to the lack of teachings inter alia, of applicants' claimed birefringent propagating medium. *Suzuki*, *Hatami-Hanza* and

Sugarawa, individually or in combination, therefore fail to teach or suggest independent claims 1, 2, 9 and 10.

In view of the foregoing, independent claims 1, 2, 9 and 10 are deemed to be patentable over the combination of *Suzuki*, *Hatami-Hanza* and *Sugarawa.* Reconsideration and withdrawal of the rejections under 35 U.S.C. §103(a) are requested, and early notice to that effect is earnestly solicited.

Patentability of the Dependent Claims Under 35 U.S.C. §103(a)

The Examiner (at pg. 9 of the Office Action) acknowledges that *Suzuki*, *Hatami-Hanza* and *Sugarawa* fail to teach or suggest the limitation "a shifting means adapted to introduce a time shift between the pulses of the WDM signals carried by the optical carriers", as recited in dependent claims 3 and 11, and cites *Horiuchi* for this feature. The Examiner (at pg. 11 of the Office Action) also acknowledges that *Suzuki*, *Hatami-Hanza*, *Sugarawa* and *Horiuchi* fail to teach or suggest "a polarization controller at the entry of the birefringent propagation medium (130) to encourage the injection of WDM/OTDM signals into said propagation medium with a polarization at 45 degrees to its main axes", as recited in dependent claim 6, and cites *Islam* for this feature.

Applicants, however, contend that no combination of *Suzuki*, *Hatami-Hanza*, *Sugarawa*, *Islam* and/or *Horiuchi* achieves the subject matter of independent claim 1 from which claims 3 and 6 depend, or the subject matter of independent claim 10 from which dependent claim 11 depends. There is simply nothing in *Islam* or *Horiuchi* to cure the above-discussed deficiencies in *Suzuki*, *Hatami-Hanza* and *Sugarawa* relating to the lack of teachings of, *inter alia*, applicants' claimed birefringent propagating medium.

Suzuki, *Hatami-Hanza*, *Sugarawa*, *Islam* and *Horiuchi*, individually or in combination, therefore fail to teach or suggest the subject matter of independent claims 1 and 10, and dependent claims 3, 6 and 11 are accordingly deemed to be patentable based *at least* on their respective dependencies from claims 1 and 10.

Indeed, in view of the patentability of independent claims 1, 2, 9 and 10, and for at least the reasons presented above, each of dependent claims 3, 4-8 and 11, as well as new dependent claims 12-16, is believed to be patentable therewith over the cited art. Each of dependent claims 3, 4-8 and 11-16 additionally includes features that serve to still further distinguish the claimed invention over the applied art.

Conclusion

Based on all of the above, applicants submit that the present application is now in full and proper condition for allowance. Prompt and favorable action to this effect, and early passage of the application to issue, are solicited.

Should the Examiner have any comments, questions, suggestions or objections, the Examiner is respectfully requested to telephone the undersigned in order to facilitate an early resolution of any outstanding issues.

Respectfully submitted,
COHEN PONTANI LIEBERMAN & PAVANE LLP

By _____

Lance J. Lieberman
Reg. No. 28,437
551 Fifth Avenue, Suite 1210
New York, New York 10176
(212) 687-2770

Dated: April 28, 2008